

EFFECTS OF HIGH DIETARY HEME IRON AND RADIATION ON CARDIOVASCULAR FUNCTION

CM Westby¹, AK Brown², SH Platts³

¹University Space Research Association, Houston, TX, United States

²MEI Technologies, Houston, TX, United States

³NASA, Johnson Space Center, Houston, TX, United States

The radiation related health risks to astronauts is of particular concern to NASA. Data support that exposure to radiation is associated with a number of disorders including a heightened risk for cardiovascular diseases. Independent of radiation, altered nutrient status (e.g. high dietary iron) also increases ones risk for cardiovascular disease. However, it is unknown whether exposure to radiation in combination with high dietary iron further increases ones cardiovascular risk. The intent of our proposal is to generate compulsory data examining the combined effect of radiation exposure and iron overload on sensitivity to radiation injury to address HRP risks: 1) Risk Factor of Inadequate Nutrition; 2) Risk of Cardiac Rhythm Problems; and 3) Risk of Degenerative Tissue or other Health Effects from Space Radiation.

Towards our goal we propose two distinct pilot studies using the following specific aims:

Vascular Aim 1: To determine the short-term consequences of the independent and combined effects of exposure to gamma radiation and elevated body iron stores on measures of endothelial function and cell viability and integrity. *We hypothesize that animals that have high body iron stores and are exposed to gamma radiation will show a greater reduction in endothelial dependent nitric oxide production and larger pathological changes in endothelial integrity than animals that have only 1 of those treatments (either high iron stores or exposure to gamma radiation).*

Vascular Aim 2: Identify and compare the effects of gamma radiation and elevated body iron stores on the genetic and epigenetic regulation of proteins associated with endothelial cell function. *We hypothesize that modifications of epigenetic control and posttranslational expression of proteins associated with endothelial cell function will be differentially altered in rats with high body iron stores and exposed to gamma radiation compared to rats with only 1 type of treatment.*

Cardiac Aim 1: To determine the short-term consequences of the independent and combined effects of gamma radiation and elevated body iron stores on measures of cardiac structure. *We hypothesize that modifications to cardiac structure and function will be greater in rats with high body iron stores and exposed to gamma radiation than in rats that have only 1 of those treatments.*

Cardiac Aim 2: Identify and compare the effects of gamma radiation and elevated body iron stores on the genetic and epigenetic regulation of proteins associated with cardiac structure and function. *We hypothesize that modifications of epigenetic control and posttranslational expression of proteins associated with cardiac contractile function will be differentially altered in rats with high body iron stores and exposed to gamma radiation compared to rats with only 1 type of treatment.*